

WHAT IS CLAIMED IS:

1. A power amplifier module which is a power amplifier module using a bipolar transistor as an amplifying element, wherein when a base current produces an amount of an overcurrent exceeding a previously set value, by detecting  
5 the amount of the overcurrent and subtracting the amount of the overcurrent from the base current, an increase in a collector current of the amplifying element is restricted.

2. A power amplifier module comprising:

a signal amplifying portion including at least a bipolar transistor as an amplifying element and amplifying and outputting an input signal;

5 a bias circuit for providing an idling current to the signal amplifying portion; and

a protecting circuit constituted such that when a base current of the bipolar transistor exceeds a predetermined value, a current having an amount of exceeding the  
10 predetermined value flows from the bias circuit to the protecting circuit;

wherein by making the amount of exceeding the predetermined value of the base current flow to the protecting circuit, an output of the signal amplifying  
15 portion is restricted to be equal to or smaller than a predetermined value.

3. A power amplifier module comprising:

a bipolar transistor for amplifying and outputting an input signal; and

a protecting circuit for detecting that a base current

5 of the bipolar transistor exceeds a predetermined value and  
subtracting a detected amount of exceeding the  
predetermined value of the base current from the base  
current:

10 wherein by controlling the base current of the bipolar  
transistor by the protecting means, a collector current of  
the bipolar transistor is restricted to be equal to or lower  
than a predetermined value.

4. The power amplifier module according to Claim 2,  
wherein the signal amplifying portion includes a matching  
circuit and the bipolar transistor constitutes a portion  
of a current mirror circuit.

5 5. The power amplifier module according to Claim 2,  
wherein the bias circuit includes a current source and a  
transistor and the transistor constitutes a current mirror  
circuit along with other transistor connected in series with  
the current source.

5 6. The power amplifier module according to Claim 2,  
wherein the protecting circuit includes a first transistor,  
a first resistor connected to a base of the first transistor,  
a second resistor one end which is connected to an emitter  
of the first transistor and other end which is connected  
to the first resistor, a second transistor connected to a  
collector of the first transistor and a third transistor  
constituting a current mirror circuit along with the second  
transistor and connected to the bias circuit.

7. The power amplifier module according to Claim 2,  
wherein the predetermined value of the base current is made

variable in accordance with a change in a power supply voltage.

8. The power amplifier module according to Claim 7, further comprising:

a voltage to current conversion circuit for inputting an output control voltage, converting the output control voltage into a current and controlling an output current of a current source;

a power supply voltage detecting circuit for detecting a power supply voltage and converting the power supply voltage into a current and outputting the current; and

a current control circuit for inputting an output current of the power supply voltage detecting circuit, converting the output current into a voltage and controlling the voltage to current conversion circuit such that when the voltage is larger than a predetermined voltage, the output current of the voltage to current conversion circuit becomes substantially constant with regard to an input of the output control voltage equal to or higher than the voltage.

9. The power amplifier module according to Claim 2, further comprising diodes for clipping voltage connected in multiple stages in parallel with the amplifying element.

10. The power amplifier module according to Claim 2, wherein the amplifying element is constituted by GaAs-HBT or SiGe-HBT and the protecting circuit includes an Si-bipolar transistor or SiGe-HBT.

11. The power amplifier module according to Claim 2,

wherein the amplifying element and protecting circuit are constituted by SiGe-HBT or an Si-bipolar transistor and are integrated into a single chip.

12. The power amplifier module according to Claim 2, further comprising:

a plurality of stages of the amplifying elements connected in series with each other;

5 wherein at least the amplifying element at a final stage is protected by the protecting means.

13. The power amplifier module according to Claim 12, wherein the final stage amplifying element is constituted by GaAs-HBT and at least one of an initial stage or an intermediary stage amplifying element is constituted  
5 by Si-MOSFET.

14. The power amplifier module according to Claim 12, wherein the final stage amplifying element is constituted by GaAs-HBT and the amplifying element at an initial stage or at least a portion of the protecting circuit  
5 is constituted by Si-MOSFET.

15. A wireless communication apparatus having the power amplifier module according to Claim 2, wherein a voice signal is modulated, the modulated voice signal is amplified by the power amplifier module and a modulated signal is  
5 outputted via an antenna.

16. A wireless communication apparatus comprising the power amplifier module according to Claim 2, an antenna, a receiving front end portion, a frequency synthesizer, a voice processing portion and a modulator and de-modulator.